

**REMARKS**

In the Office Action, claims 1-39 were rejected. By the present amendment, claims 5, 12, 18, 25, 30, and 37 are amended to clarify the scope of the claims. Upon entry of these amendments, claims 1-39 will remain pending in the present patent application. Reconsideration and allowance of all pending claims are requested.

**Rejections Under 35 U.S.C. § 102**

The Examiner rejected claims 1-6, 10-19, 23-31, and 35-39 under 35 U.S.C. § 102(e) in view of U.S. Patent No. 6,842,638 (the "Suri reference"). Anticipation under 35 U.S.C. § 102 requires a showing that each limitation of a claim is found in a single reference, practice or device. *In re Donohue*, 226 U.S.P.Q. 619, 621 (Fed. Cir. 1985). The Applicants respectfully traverse the present rejection.

With regard to independent claim 1, claim 1 is directed to a method for generating a bone mask. In particular, the method of claim 1 recites, *inter alia*, the acts of generating a preliminary bone mask from an image data set, automatically determining a vascular structure using one or more seed points, one or more structure edges, and the image data, and subtracting the vascular structure from the preliminary bone mask to generate a bone mask. Likewise, independent claims 14, 27, and 39 recite similar limitations in the context of tangible media and image analysis systems.

Conversely, the Suri reference is generally directed to generating an image of a vascular tree. Suri, Abstract. For example, the Suri reference describes the identification of vascular edges in images slices which are flood-filled and subsequently eroded to identify the vascular centers. Suri, col. 3, lines 2-15, 21-27, and 48-52. The vascular centers are representative of the vascular system and may be used as inputs in subsequent processes, such as to propagate boundaries about the vessel centers to form a vascular

tree. Suri, col. 3, lines 8-15, 24-27, and 36-41. The Suri reference, however, does not teach the generation of a bone mask, as recited in independent claims 1, 14, 27, and 39.

For example, as noted above, independent claim 1 recites the act of generating a preliminary bone mask from an image data set. Such a preliminary bone mask is described in the Application as including bone and certain contrast-enhanced vascular structures. Application, p. 15, lines 4-19. A preliminary bone mask is also recited in independent claims 14, 27, and 39. Such a preliminary bone mask, however, appears to be entirely absent from the Suri reference.

The Examiner presumably is equating the intermediate mask 198 with the recited preliminary bone mask of claims 1, 14, 27, and 39. Office Action, pp. 2-3, section 3. Such a position, however, would be erroneous. In particular, as recognized by the Examiner and as explicitly described in the Suri reference, the intermediate mask is not a bone mask, preliminary or otherwise, but instead classifies air, bone, muscle, and vascular vessels together. Office Action, p. 2, section 3; Suri, Fig. 9 and col. 12, lines 21-36. In particular, as described in the Suri reference, the class assignment processor 194 that generates the intermediate mask 198 assigns each pixel of a slice as either black or gray, with black pixels corresponding to bone, air, muscle, or vascular structures and the gray pixels corresponding to background tissue. Office Action, p. 2, section 3; Suri, Fig. 9 and col. 12, lines 21-32. As a result, the intermediate mask 198 is not a preliminary bone mask, as recited, but is instead a combination of various non-vasculature (i.e., bone, muscle, air, and so forth) as well as vasculature.

Further, removing a vascular structure from such an intermediate mask 198 will not generate a bone mask as recited in claims 1, 14, 27, and 39. Instead, as described in the Suri reference, removing vascular regions from the intermediate mask 198 generates a slice mask 204 that includes non-vascular structures in general, i.e., bone, air, and muscle. Suri, Fig. 9 and col. 12, lines 41-54. Such a generalized non-vascular structure mask is

clearly not a bone mask as recited in independent claims 1, 14, 27, and 39 and as described in the present Application. As a result, the Suri reference is also silent as to the generation of a bone mask, as recited in independent claims 1, 14, 27, and 39. In view of these deficiencies of the Suri reference, no case of anticipation has been made by the Examiner with regard to independent claims 1, 14, 27, and 39. Likewise, those claims depending from independent claims 1, 14, 27, and 39 are likewise believed to be allowable for at least these deficiencies of the Suri reference.

However, the dependent claims rejected under 35 U.S.C. § 102(e) are also believed to be allowable in view of the subject matter they separately recite. For example, claims 2, 15, and 28 generally recite the subtraction of the bone mask from the image data set to generate a bone-free volume data set. Likewise, claims 3, 16, and 29, generally recite rendering the bone-free volume data set to generate a bone-free volumetric rendering. This subject matter of these and other dependent claims appears to be entirely absent from the Suri reference and the Examiner has not indicated where in the Suri reference the Examiner believes this subject matter is disclosed. If the Examiner wishes to maintain the present rejections of these and other dependent claims the Applicants respectfully request that the Examiner cite with specificity to where in the Suri reference such subject matter is disclosed, as required by 37 C.F.R. § 1.104(c)(2).

In view of the deficiencies of the Suri reference noted above, the Applicants respectfully request reconsideration and allowance of independent claims 1, 14, 27, and 39 and those claims depending therefrom.

### **Rejections Under 35 U.S.C. § 103**

The Examiner rejected claims 7-9, 20-22, and 32-34 under 35 U.S.C. § 103(a) as being unpatentable over the Suri reference in view of U.S. Patent No. 6,351,571 (the VanMetter reference). The burden of establishing a *prima facie* case of

obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984).

Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Applicants respectfully traverse the present rejections under 35 U.S.C. § 103(a).

The Applicants respectfully note that claims 7-9, 20-22, and 32-34 are respectively dependent on independent claims 1, 14 and 27, discussed above. The Applicants further note that the VanMetter reference fails to obviate the deficiencies of the Suri reference noted above with regard to independent claims 1, 14, and 27. Therefore, claims 7-9, 20-22, and 32-34 are believed allowable at least for the reasons given above with regard to their respective independent claims.

In addition, claims 7-9, 20-22, and 32-34 are believed to be allowable for the subject matter they separately recite and for the lack of motivation to combine the

Suri and VanMetter references in the manner described by the Examiner. For example, claims 7, 20, and 22 generally recite partitioning an image data set into two or more sub-volumes. This subject matter appears to be entirely absent from both the Suri reference and the VanMetter reference. In particular, the VanMetter reference appears to be directed to the processing of images, such as rectangular digital images, not volumes. VanMetter, Figs. 1 and 2, Abstract, col. 1, lines 6-10, col. 2, lines 1-43, line 66 through col. 3, line 4. As the Examiner will appreciate, such a rectangular digital image is not a volume or a volumetric representation, such as the recited sub-volume. Likewise, claims 8, 21, and 33 recite the differential processing of two or more sub-volumes. As such sub-volumes are not disclosed in the VanMetter reference, the differential processing of such sub-volumes is also not disclosed.

Further claims 9, 22, and 34 recite that the differential processing comprises implementing a fast algorithm in at least one sub-volume and a complex vessel tracking algorithm in at least one other sub-volume. As noted, the VanMetter reference appears to be silent with regard to volumes and/or sub-volumes. Further, contrary to the Examiner's position, the VanMetter reference appears to be silent as to the presence of fast and complex algorithms used in differential processing in the manner recited. The Examiner appears to assert that the convolution operator and the mask-weighted convolution operator of the VanMetter reference are these respective recited algorithms but, as recited, the respective algorithms are used to differentially process sub-volumes of an image data set. To the contrary, the convolution operator and the mask-weighted convolution operator of the VanMetter reference appear to be used in the alternative, i.e., the convolution operator appears to be used in processing an entire image while the mask-weighted convolution operator appears to be used in processing an arbitrarily specified region of interest in an alternative embodiment. VanMetter, col. 2, lines 1-40. Based on the passage cited by the Examiner, both the convolution operator and the mask-weighted convolution operator appear to perform exactly the same function, but on differently

shaped regions of interest. *Id.* Further, the VanMetter reference appears to be entirely silent as to the subject matter of a complex vessel tracking algorithm, as recited in claims 9, 22, and 34. The Applicants respectfully request that, if the Examiner intends to maintain the present rejections, the Examiner cite with specificity to where the subject matter noted above is disclosed in the cited references, as required by 37 C.F.R. § 1.104(c)(2).

Further, the Examiner has not provided a sufficient motivation to combine the Suri and VanMetter references. M.P.E.P. § 2143.01. In particular, the Examiner has merely stated that: “[i]t would be obvious to one with ordinary skill in the art at the time of the invention to combine VanMetter et al. with Suri et al. as Suri et al. teaches using edge enhancements, for which one could use VanMetter et al.’s edge enhancement algorithms to execute the edge enhancement.” Office Action p. 4, section 8. As the Examiner will appreciate, the prior art must suggest the desirability of the claimed subject matter. M.P.E.P. § 2143.01 I. The mere fact that references can be combined (and the Applicants do not concede that the Suri and VanMetter references are indeed combinable) or modified as suggested by the Examiner does not make the combination of references obvious unless the prior art also suggests that the combination is desirable. M.P.E.P. § 2143.01 III. In the present case, the Examiner has made no argument that the either reference suggests the desirability of the asserted combination and has instead merely asserted that the technique of VanMetter could be used with the technique disclosed in the Suri reference. Such a bald and baseless assertion is clearly deficient to support the asserted combination of references.

Further, after reviewing the references, the Applicants do not believe that the references themselves explicitly or implicitly suggest their combination. Indeed, the only basis for the combination of the Suri and VanMetter references is the Examiner’s apparent desire to deprecate the claimed subject matter of claims 7-9, 20-

22, and 32-34 using the hindsight gained from the Application itself. As noted above, examination based on such hindsight, as opposed to the teachings of the references themselves, is strictly prohibited. Absent a valid motivation to combine the cited references and in view of the deficiencies of the combined references as noted herein, no *prima facie* case of obviousness has been established by the Examiner. Reconsideration and allowance of claims 7-9, 20-22 and 32-34 is therefore respectfully requested.

### **Conclusion**

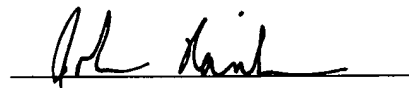
In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

### **Authorization for Extensions of Time and Payment of Fees**

In accordance with 37 C.F.R. § 1.136, Applicants hereby provide a general authorization to treat this and any future reply requiring an extension of time as incorporating a request thereof. The Commissioner is authorized to charge any additional fees which may be required to Deposit Account No. 07-0868; Order No. GERD:0073/YOD/RAR (140312-1).

Respectfully submitted,

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